SUBJECT INDEX

Analyzer Crystals
  XRFA 225-6, 228-9
Angstrom Ruler Interferometer 16-8
Anomalous Dispersion Corrections
Photon Energies L100KeV 1-41
  International Tables 9-11
  theory 6-13
  experimental 13-26
  X-ray interferometer 14
  basic LLL 14-5
  Bonse or DESY 15-6
  Angstrom Ruler 16-8
  linear attenuation 18-21
  refractive index, prism 21-2
  total internal reflection 22
  Pendellosung technique 22-3, 27, 40
  reflective measurements 23-4
  diffracted intensity 24-6
  Friedel pairs 24-6
  theory, experiment comparison 26-9
    high energy 27
    intermediate energy 27-8
    edge 28-9
  applications
    amorphous material 30-6
    EXAFS 31-6, 40
    gas 30-2
    liquid 32-3
    solid 33-4
    surface 34-6
    single crystal 36-40
    organic, small 36-9
      SIRAS 37-8
    inorganic 39
    Friedel pair studies 39
    perfection 40
    small angle scattering 40
    crystalline solids 40
Array Processor 495-5
Atomic Scattering Factor 1-11, 40
  condensed matter 3-11
  theoretical calculations 5-11
  anomalous scattering 6-13

BET Method, Specific Surface
  area measurements 208
Bijvoet Pairs 25, 36-8, 56
Bloch Walls 413
Bonse (or DESY) Interferometer 15-6
Bormann Effect 39
  monochromator 39-40

Box Functions 56, 69
Brazil Twins 36, 369, 370-1
  domains 368, 370-1
  dynamical fringe contrast 369
  boundaries 370-1
Bremstralung Radiation 20, 218-9, 228
Broadening X-ray Maxima 130-2
Burgers Vector 109, 143-6, 488-91

Claisse/Quinton Model 240, 243-5
Close-packed Structures 105-8
Clusters 49, 66, 82-7, 97-8
Compton Scattering 2, 47, 320
Constant Step Algorithm
  (CSA) 480-1, 483, 493
Cornell High Energy Synchrotron
  Source (CHESS) 194
Crystallite/Domain Size
  measurement 200-7
Crystals 317

Darwin's Extinction Theory 322
Darwin's Mosaic Model 355-6
Dauphine Twin Element 369, 371, 382,
  394, 396, 429, 432, 503
Delbruck Scattering 2
DESY (or Bonse) Interferometer 15-6
Diamond Anvil Cell 264-6
Differential Scanning Calorimetry
  (DSC) 208
Difuse Layers (dl) 48-9
Diffuse Streaks (d.st) 48, 83-4, 88,
  90
  stack sequence of layers 48
Diffuse X-ray Scattering 47-98
  inelastic 47
  defects 48
  diffuse layers (dl) 48-9
  diffuse streaks (d.st) 48-9
  symbols 49-50
  Fourier Transforms (FT) 51-7
  Ewald's method 52
  operations 52-4
  points and lattices 54-6
  Gaussian function 56
  box functions 56, 69
  distribution of functions 57
  application FT theory 58-74
  averaged and disordered

structures 58-9
multicomponent mixed crystals 59-62
cubic body centred 62-4
one-dimensional order 64-6
cluster method 66-7
distribution functions 67-8
lamellar structures 68-70
long range order 70-2
modulated structures 72-3
integrated intensities 73-4
experimental method 75-9
satellites 76
line profiles 76
synchrotron sources 77
monochromators 77-8
optical simulation 78-9
experimental and theoretical results 80-97
point defects 80-3
dislocations and clusters 83-4
Guinier-Preston zones 84-7
disorder, 1-dimensional 87-9
2-dimensional 90-6
3-dimensional 96-8
Diffuse X-ray Scattering (cont)
pseudo-thermal Debye-Waller factor 91
helical structure 91
stacking fault in chains 91-5
correlation functions 97
Directionally Diffuse Intensity
measurement 135-9
Dislocations 83-4
Domain Boundaries
antiferromagnetic xFe_2O_3 407
Domain Wall Motion 403, 412-3
magnetic 403, 412
ferro-electric 412-3
polarization reversal 413
Dynamical Disorder Processes 47

Eigen Symmetry 395-8
Ennal-Nonius Diffractometer 136-7
Ewald's Method 52
Ewald's Sphere 136-7
Extended X-ray Absorption Fine Structure (EXAFS) 1, 31-6, 40
REFLEXAFS 35

Ferroelectric-Ferroelastic
crystal GDMO 502
phase transition 317
Ferromagnetic Domains 503
FET 226
Floating Zone <001> Si Crystal 347-54
Fourme's Pressure Cell 267
Fourier Method
microstructure 200
line broadening analysis 205, 207
Fourier Transforms (FT) 51-7
Frenkel Pairs 82
Freidel Pairs 22, 35-9, 369, 381, 396
Full Width Half Maximum Intensity (FWHM) 186-9, 195, 201-2, 315, 317, 324, 328-34

Gamma-Ray Diffractometry Single Crystal,
Characterization of
Perfection 315-62
X-ray sources 319-24
rocking curves 320, 322-5, 238-34, 340
double crystal diffractometer 324-30
applications 330-4
mosaicity of VA 330-1
of FeS_2 332-2
Czochralski grown Cu 331-2
bent Si wafer 333-4
Pendellosung intensity beats 334-40
theory 335-40
experiments 340-54
Si-220 structure factor 340-6
anisotropic strain 001 Si 347-54
Gamma-Ray Diffractometer 317-20, 324-30, 349
HMI 325
Julich type 320
4-circle automated 324
double crystal 318, 324-30, 349
Gaussian Curves 56, 70, 191, 194, 197, 201, 204
General Purpose Powder Diffractometer (GPPD) 197
Ge Solid State Detector 316, 320-3
Gunier Preston Zone 40, 84-7

Heterojunction Lasers 465
High Angle Tilt Boundary 367
High Flux Reactor (HFR) 193, 196
High Resolution Powder
Diffractometer (HRPD) 197, 200
Huang Diffuse Scattering (HDS) 81, 83

Imaging, X-ray Fluorescent Analysis 213
Image Intensifiers 403
Image Processors 406
Interbranch Scattering 370

Japanese Industrial Standard (JIS) Method 241

Kato's Statistical Dynamical Theory 354-62
Keller-Holzappel Cells (K-H) 263, 265, 271-3, 287, 290-1, 296
Kink 143-5
Kramers Theory 218
Kramers-Kronig Integral 7, 18, 21, 27-8, 30

Lachance-Traill Model 238-40, 243
Landau's Theory 49
Lang Topography 36, 367-98, 434, 467-9
section 468

traverse 468-9
see X-ray topography
Laue Class 368, 380
conditions 38-9, 90, 114, 316, 338, 340, 347
equations 4
planes 14-5, 35
Laue Topography 406, 426, 434, 437-9, 447-58, 466, 488, 494
Layer Displacement Mechanism 161
Layer Structures 105
Light Element Analysis 213, 252-4
LLL Interferometer 14-5
Linear Attenuation Coefficient 18-21, 30, 39
Linear Chains (ordered) disorder of packing 49
Line Profiles 76
Lorentzian Curves 191, 194, 198, 200-1, 204

Marburg Pressure Cell 263, 265, 278-85, 295, 297
diffracting geometry and techniques 279-82
Masks, Uniformly Redundant Mask (URM) 252
coherent (CM) 252
Merohedry, Twinning By 369, 380-9, 395, 398
Merrill-Bassett Cells 263, 265, 268-73, 290-6
modifications 270
high T-high P 270
very high up 271
Metallic Clusters 34
Microfocus X-ray Tube 406
Micro Strains, measurement 200
Mithril Direct Measurement Program 200
Mosaic Distribution 317, 356
MPI-Cell, Be gaskets 285-6, 295-7
Multistrip Coupler 416-7

Neutron Diffraction
elastic diffuse scattering 47
Neutron Irradiation 83
Noromosaic Technique 76-7, 89, 94
Nuclear Emulsion 406, 408, 413-4, 434
Nuclear Resonance Scattering 2
Nuclear Thomson Scattering 344

Pattern Decomposition 185-7
Patterson Function 56, 97
Patterson Fitting Structure Refinement (PFSR) or Rietveld Method 185-6, 188, 192-9
Pendellosung Fringes 375, 377, 433
Pendellosung Intensity Beats 316, 318, 326, 334-40
observation 334-5
theory 335-40
Si 220 structure factor 34304
<001> Si 347-54
YIG single crystal 359
Pendellosung Technique 22-3, 27, 40
Phase Transition
(see α-β Quartz 425-61)
Phosphors 405-7
PIXE (highly accelerated protons) 257-8
Plastic Deformation 65, 88
Pliagioclases 75-6
Point Defects 48-9
see X-ray Topography, Simulation of Images 465-504
Polymer Structures 197-9
Polytypic Materials 175
Powder Diffraction Data,
Pattern Fitting 185-209
Rietvald or PFSR 185-6
pattern decomposition 186-7
variance method 187
R-factors, estimated standard deviations 187-8
variation of width with angle 188-90
peak shape function 191
application Rietvald 193-9
conventional X-ray sources 19304
synchrotron radiation 194-6
neutron angle-dispersive data 196
spallation neutron sources 196
refinement polymer structure 197-9
powder decomposition methods 199-205
total pattern fitting 199-200
imperfection studies 200-5
variance method 205-9
size broadening 205-7
size-strain analysis 207-8
imperfections, thin films 208-9
Powder Least Squares Refinement Program 199
Pressure Dependent Structure 40
Probability Tree 149
Probability Density Function (pdf) 303, 307-10
Gram - Charlier expansion 307-8
Profit, Profile Fitting Program 201

Quartz, α-β Phase Transition
by X-ray topography 425-461
head capacity 427-8
thermal expansion 427, 429
micro twin model 430
intermediate phase (IP) 425, 426, 431-2, 441
experiment 432-7
specimen 432-3
X-ray source 433
Lang topograph 434
Laue topograph 426, 434, 437-9, 447-9, 450-3, 451-8
fine beam 434-5
multibeam 434, 448
satellite topography 434-5, 437-9, 441, 446-8
furnace 437-7
satellite spots 437-9
IP experiment 441-57
average structure 448-9
domain 449-53
1st order transition 453-7

Rasberry/Heinrich Model 241, 245
Rayleigh Scattering 2, 7, 11, 13, 416
Real-Time Detectors 405-13
Real-Time and Stroboscopic Topography 403-21
  X-ray to video signal 404
  X-ray to electric signal 404
  detector 1st stage 405-6
  integration time 406
  intensity 406-7
  field of view 408
  conversion system 410
  phase transformation
  melting in Si 411-2
  in Al and DKDP 412
  magnetic and ferro-magnetic domain wall motion 412-3
  stroboscopic topography 413-4
    low frequency 413
    high frequency 414
  acoustic wave devices 414-8
    bulk 414-5
    surface (SAW) 415-8, 418-21
  white radiation contrast of SAW 418-21
  orientation contrast 419-21
  wavefield deviation contrast
Rietveld Method (or PFSR) 185-6, 188, 192-9, 204
Rilles 415-6
Rose de Vries Law 404
Rotating Anode Generators 406, 411

Satellite Layers 73
Satellite Peaks 69, 72, 75, 86, 89, 98
Satellite Topography (STI) 434, 437-9, 441-53, 453-8
Schottky Barreir 227
Scherrer Constant 202, 204, 206
Schiferl Diffracting Arrangement 263, 265, 274-7
Schiferl Pressure Cell 274-7, 297
  antimony 275
  quartz 277
SEM 208
Shockley Partial 109
Single Crystal Diffractometer 135
Single Crystal, X-Ray Diffraction, High Pressure 263-302
  early cells 265
  NBS lever anon cell 265-7
    benzane 266-7
  Fourme's pressure cell 267-8
    chlorobenzene 268
  Merril-Bassett cell 268-71
    modifications 270
  Keller Holzappel cell 271-3
  Schiferl cell 274-7
    antimony 275
    modifications 275-6
    quartz 277
  cells, permeable gaskets 278
  Marberg cell 278-85
    $K_2Zn(CN)_4$ 9/4 H_2O 282-5
  MPI cell, Be gaskets 285-6
    cordierite 286
  pressure measurements 286-7
    pressure transmitting medium 287-9
    fixing crystal 289
    signal/background 289
    correction absorption and shadowing 293
Single Crystal X-ray Diffraction at High Temperature 303-14
  K $LiSO_4$ 310-4
Single Crystal, Characterization of Perfection, see Gamma-ray Diffractometry 315-66
Single Crystal, Diffraction Studies see Stacking Faults in Close Packed Structures 103-84
Single Isomorphous Replacement Using Amorphous Scattering (SIRAS) 37-8
Silicon Diode Array Camera 405-6
Size-Strain Analysis 207
Solid State Detectors 252
Soller Collimators 188, 195
Spallatron Neutron Source (SNS) 193, 196-8, 200
Special Experimental Powder Diffractometer (SEPD) 197
Stacking Faults 500
Stacking Faults In Close-Packed (cp) Structures, Single Crystal Diffraction Studies 103-178
  cp structures 105-8
  stacking faults 108
  growth fault 108
  deformation fault 109
  layer displacement fault 109-10
  extrinsic fault 110
  X-ray diffraction for cp 110-4
    hcp and ecp 111-4
  randomly faulted 114-29
    in ZnS 129-34
    in 2H SiC 134-5
  directionally diffuse intensity measurements 135-9
  non-random faulting 139-75
  phase transformations
    in ZnS 140-2
    in SiC 142
    models 142
  periodic slip mechanism 143-6
  non-random nucleation
  stacking faults 146-7
  calculation 147-161
  3-parameter model 148-58
  2H - 3C transformation 159
  2H - 6H transformation 159
  2H - 6H by layer displacement 161-8
  validity of assumptions 174-5
Stacking Sequence of Layers 48-9
Strain Field 80,2, 85, 97
Surface Acoustic Wave (SAW) Device 415-21
Super Satellites 75-6
Synchrotron Radiation 406-9, 413, 421
  sources (SRS) 193-6
  European Synchrotron Facility Wiggler Line (ESRF) 407, 409
  topography 369

Takaqui-Taupin (T-T) Equations 469-70, 483, 485, 494, 500

Tertian's Model 242, 245
TEM 47, 81
Thermal Neutrons 47
Thin Film Analysis 213, 233-7
Thomson Scattering 2
Time of Flight Techniques 193, 196-200
Trace Analysis 213, 257-8
Twinned Crystals, X-ray Topography 367-98
  lattice symmetry
  twin not belonging to 368
  pseudo hexagonal 368
  twin belonging to 369
  not to have class 369
  Brazil twin 369, 370-1
  imaging boundaries 369-72
  strain concentrations 370
  interbranch scattering 370
  fault factor f
  fine scaled twin domains 371-2
  non-parallel lattices 372-80
    $LiNH_4SO_4$ or (LAS) 372-7
    $(NH_4)_2SO_4$ 378
    Rochelle Salt 379-80
  parallel lattices
  (merohedry) 380-4
    $KLiSO_4$ 380-3
    $NaLiSO_4$ 383-4
  inversion boundary 371, 385-6, 387-9
  partially parallel lattices 390-3
    $FeBo_3$ 390, 392-3
    Al_2O_3 390, 393
  dislocation boundaries 393-5
  domain contrast, selection of reflections 395-8

Variance Method 185, 187, 200, 205-9
Varying step Algorithm (VSA) 481-5, 502
Vidicon, PbO target 403, 405, 411

Wavelength Dispersive Devices 252
Williamson-Hall Plot 202-3
Wilson's Theory of Renormalisation 49

X-Ray Attenuation Coefficient 14
  experiments 14, 18-21
X-Ray Diffraction
  see Single Crystal, High P 263-298
  see Single Crystal, High T 303-14
  see Stacking Faults in close-packed structures 103-178
X-Ray Dynamical Theory 446, 469-83
X-Ray Fluorescence Analysis (XRFA) 1, 213-258
  Bohr's Theory and Moseley's Law 213-4
  paractical representations 215
  quantum numbers and selection rultes 215-6
  notation of lines 216
  units and constants 217
  instrumentation 217-30
  excitation of X-rays 218-225
  tubes 218-25
  targets 218
  Bremsspektrum 219-22
  characteristic lines 222-4
  intensity distribution 224
  generators 225
  detection systems 226-7
  secondary targets and polarised X-rays 228-9
  total reflection techniques 229-30
  theory of intensity of fluorescent radiation 230-7
    basic 230-1
    bulk materials 231-2
    secondary enhancement 332-3
    thin films 233-7
  empirical parameter methods 238-40
  Lachance-Traill 238-40
  Claisse/Quintin 240
  Rasberry/Heinrich 241
  JIS method 241
  Tertia model 242
  differential methods 242-3
  fundamental alphas 243-4
  stoichiometric components 244
  other methods 244-6
  imaging X-ray analysis 246-52
  line scanning in XRF mapping 246-9
  area scanning 250-2
  light element analysis 252-8
  solid state detectors 252
    dispersive devices 252-4
  thin film analysis 254-7
  trace analysis 257-8
X-Ray Interferometry 14-21, 27
X-Ray Refractive Index 21-2
X-Ray Scattering
  small angle 40
X-Ray Sensitive Camera 404, 407
X-Ray Topography 36, 40
  See Real Time and Stoboscopic 403-21
  See α-β Quartz, Phase Transition 425-61
X-Ray Topography, Simulation of Images 465-504
  experimental techniques 466
  Lang's method 467-9
  dynamical theory 469-75
  Takaqui-Taupin (T-T)
  equations 469-70, 494
  boundary conditions 471-3
  application 473-5
  section topography 473-4
  plane wave topography 474
  traverse topography 474-5
  numerical integration of T-T equations 475-80
  half-step 475-7
  numerical approximation 477-8
  boundary conditions 478-80
  constant step algorithm
  (CSA) 480-5
  varying step algorithm (VSA) 480-5
  simulation 483-6
    real topographs 483-5
    traverse 485, 488-9
    representation image 485-6
  dislocation, contrast 487-93
  deformation, anisotropic medium 487-8

dislocations, section topography 488-90
Burgers vector 488-91
elastic anisotropy 491-3
Reuss average 492
geometry of reflection 493
dislocations, traverse topography 494-8
images, Bragg case 498-9
contrast, stacking faults 500-1
images in L-L case 501
images in L-B case 501-2
other defects 503-4

COMPOUND INDEX

Ag 26, 224, 255-6, 434
Al 40, 219, 252, 254, 256, 324, 412, 465
AlN 35-6
AlOOH 204
Al_2O_3 36, 192-4, 197, 199, 254, 269, 286, 390
Ar 287
As 465
Au 26, 64, 255-6, 317-22

B 213, 218, 252-4
BC 287
BP 25
$BaSrWO_6$ 194
$BaTiO_3$ 36
Be 14, 265-9
BeO 404
Bi_2O_3 194
Br 30, 35
Br2 30

C 19, 82, 197-8, 213, 218, 252-4, 369, 411
Ca 225
$CaCO_3$ 207, 269, 376
Cd 251
$CdBr_2$ 110
CdI_2 105, 107, 110, 118, 175, 177
CdS 148
CdSe 25
CdTe 369
CeO_2 177, 255
Co 177, 255
$Co(N_2C_3H_3)_2$ 25
Cr 219, 223-4
Cr_2O_3 269
Cs 320-1
$CsAu^{I}Au^{II}Cl_6$ 272
CsCl 320
CsI 405, 407
Cu 19, 26, 35, 40, 64, 252, 254, 315, 320-2, 434

F 254
Fe 249, 254-5, 465
$FeAsO_4$ 200
$FeBO_3$ 390
FeO 471
$-Fe_2O_3$ 407, 412
FeS_2 332
Fe-Si 411-2

Ga 32, 227, 465
GaAs 25-6, 412
GaP 25-6
Gd 254
$GdDy(MoO_4)_3$ 369
Gd_2O_2S:Tb 405, 407
Ge 26, 32, 34, 218, 226-7, 316, 412
GeSe 34
$GeSe_2$ 33

H 82-3
H_2 287
He 287-8
Hg 32
HgI_2 218, 226-7
In 288

KBr 40
KCl 369
KH_2PO_4 317, 490, 492
$KLiSO_4$ 310-4, 371, 380, 393, 396
$K_2Zn(CN)_4$ 9/4 H_2O 282-5

LiCl 196
LiF 14, 22, 26-7, 226, 253
$Li_{1-x}M_2O_3$ 193
$LiNH_4SO_4$ 370, 372-7, 385-9, 394
$LiNbO_3$ 36, 415-9
$LiTaO_3$ 194
$LiUCl_6$ 196

Mg 219, 229, 252
$Mg_2CO_3(OH)_4$ $2H_2O$ 91
Mg_2SiO_4 197
MnS 148
Mo 26, 219, 229, 253, 289

N 82-3, 213, 218, 411
N_2 287
$(NH_4)_2SO_4$ 372

$(NH_4)\ H_2\ PO_4$ 504
Na 213, 219, 252
NaCl 196
NaF 14
$NaCoGeO_4$ 369
Na_2UCl_6 196
Nb 82-3, 229
Ne 287
Ni 34, 40, 188, 192-3, 196-7, 254-6

O 34, 82-3, 213, 218, 411
O_2 269
O_5 34

P 411
Pd 254
Pt 26, 34, 192-3

RbCl 40
RbH_2PO_4 317
Rh 219, 254

Sb 255-6, 275
Se 32, 34
Se-As 410
Si 14, 19, 21, 26-7, 35, 219, 252, 255-6, 316, 318, 324-54, 360, 411, 465, 483, 488, 492, 496
SiC 88-9, 105, 110, 118, 134, 146, 148, 174-5
Si(Li) 35, 218, 252
SiO_2 36, 83, 194, 277, 269, 270, 414-8
$-SiO_2$ 199
SmO_3 324
SmSe 40
Sn 465

Ta 26, 82, 229
Ti 255-6
Ti-Zr 282

U 213
UN 40

Va 322-5, 330-1
VaBr 40

W 26, 219, 223
WO_3 185

Xe 30

Zn 26, 32, 255-6, 465
ZnO 188-9, 192-3, 201-6
$Zn_3\ (OH)_4\ (NO_3)_2$ 201
ZnS 105-176
$Zn_xCd_{1-x}S$ 140, 168, 171, 175
2H $Zn_{0.94}Cd_{0.06}S$ 140-1
$Zn_xMn_{1-x}S$ 140, 168, 171-2, 175
ZH $Zn_{0.9}Mn_{0.1}S$ 141

Alloys

Al-Ag 40
Al-Zn 40
Al-Zn-Mg 40
Fe-Si 411-412
Se-As 410

Organic Compounds

$CHLiO_2.H_2O$ 371
H_2NCONH_2 289
CH_3OH 287, 289
C_2H_5OH 287, 289
$CH_3CHOHCH_3$ 287
$(CH_3)_2\ CHCH_2\ CH_3$ 287
$C_6H_{17}N_3O_{10}S$ or (TGS) 371, 492
$C_8H_5O_4$-Rb or (RAP) 226, 253
$C_8H_5O_4$-Tl or (TAP) 226, 253
$C_{17}H_{35}COO$ or (LSD) 253
(TAAP) 371
PET, ADP, SHA 226
Salcyclic-aldehyde-methyl-imine-metal II complexes (Cu, Ni) 89
di-ethyl phenazanuum iodide 94
2-3-dichloro-6,7, dimethylanthracene 96
GDMO 502